Project Introduction

We will develop a Coevolutionary Decision Support Tool (CDST) that explicitly incorporates weather uncertainty (non-probabilistically) into strategic Traffic Flow Management (TFM) and automatically generates robust rerouting strategies for the National Airspace System (NAS) operating in inclement weather. The CDST will utilize coevolutionary algorithms (CEAs) (an emerging class of algorithms extending traditional genetic algorithms) to concurrently search the solution spaces of aircraft routing strategies and hazardous weather scenarios. By using the tool, Airline Operations Control (AOC) and Air Traffic Control System Command Center (ATCSCC) Traffic Management Unit (TMU) personnel can achieve two key strategic TFM objectives: 1. Identification of robust aircraft rerouting strategies, i.e., strategies which perform well against a large spectrum of hazardous weather scenarios, and 2. Discovery of vulnerabilities of the NAS with respect to certain weather conditions. The CDST will employ new theoretical and conceptual (non-probabilistic) methods of incorporating weather information into strategic TFM planning, also developed a part of this project. These methods will be subsequently utilized to create efficient computational representations of weather scenarios and aircraft rerouting strategies which can be manipulated by CEAs. In addition, a set of metrics for assessing the quality, or fitness, of produced solutions (both weather scenarios and rerouting strategies) will be developed as well as a metric for measuring the improvement of achieved TFM robustness. The CDST will be implemented in a prototype system which will be subsequently used to demonstrate feasibility of the proposed approach. This technology will be developed to Technology Readiness Level (TRL) 2 by the end of Phase I, and TRL 4 prototype system by the end of Phase II.

Primary U.S. Work Locations and Key Partners

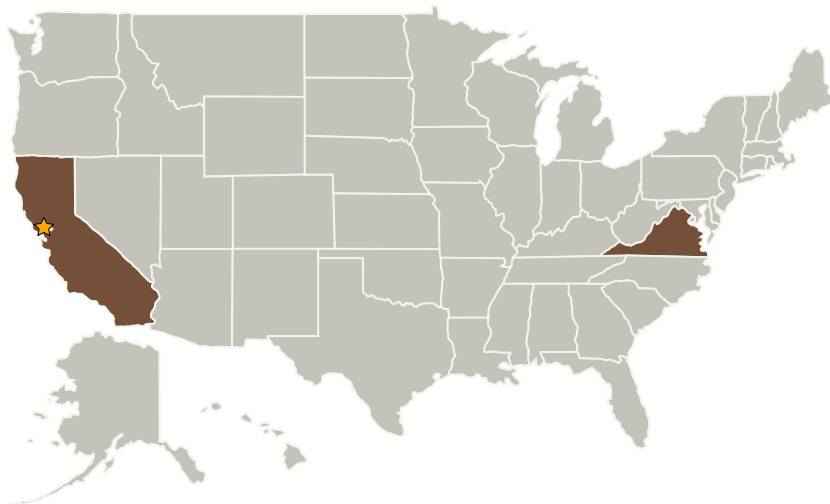Robust Traffic Flow Management: Coevolutionary Approach, Phase I

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
⭐Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Metron Aviation, Inc.	Supporting Organization	Industry	Dulles, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Rafal P Kicinger

Technology Areas

Primary:

- TX16 Air Traffic Management and Range Tracking Systems
  └ TX16.3 Traffic Management Concepts